HIV/AIDS and associated morbidity and mortality among hospitalised children in Kilifi, Kenya

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Abstract: This study was carried to determine the frequency of HIV/AIDS and associated morbidity and mortality among children hospitalised in the paediatric ward at the Kilifi District Hospital, Kenya. All 7519 children admitted between January 2004 and June 2005 were eligible for the study. Testing for HIV antibodies was done using Determine and Unigold tests. Of the admitted children, 163 (2.2%) had clinical features of AIDS. Sixty (36.8%) of the HIV-positive children were below <18 months and 103 (64.2%) were ≥ 18 months old. There were 84 (51.5%) boys and 79 (49.5% girls). The median age was 2 years (range =8 days to 11 years). The median duration of hospital stay for children with AIDS was 11 days (range 2 days to 6 weeks). The commonest causes of admission for children with HIV/AIDS were malnutrition (40.8%) and pulmonary tuberculosis (20.9%). Bacillus species were the most common isolates from the children blood samples with malnutrition. The inpatient mortality of 20.9% was observed among HIV positive children and malnutrition was a co-morbidity in 42.1% of those who died. In conclusion, this study revealed that the prevalence of paediatric HIV/AIDS in this area is high and appropriate interventions need to be taken to contain the worsening situation.

Key words: paediatric HIV/AIDS, opportunistic infections, hospital, Kenya

Introduction

Since the beginning of the Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) epidemic, approximately 2.7 million children have developed AIDS-related diseases (UNAIDS 2004). More than 90% of these infections occur in developing countries. Sub-Saharan Africa, with about 10% of the world's population, is the home to more than 60% of all people living with HIV. In 2005, an estimated 3.2 million people in the region became newly infected, while 2.4 million adults and children died of AIDS (World Bank, 2006).

HIV/AIDS in sub-Saharan Africa is resulting in substantial child mortality and an increase in the number of sick children presenting to health services (Walraven *et al.*, 1996). HIV infection causes damage of the cell mediated immunity and subsequent development of various opportunistic infections (Lucas, 2002). Conditions like malnutrition, tuberculosis and acute respiratory tract infections are more common in HIV infected children than in non HIV infected children (Fontanet *et al.*, 1998; Kawo *et al.*, 1995). HIV infected children with other infections often respond to locally available antimicrobial treatment, but may require longer courses, hence longer duration of hospitalisation.

The patterns of opportunistic diseases are different in different parts of the world, depending on the local prevalence of latent and acquired infections and on the survival of HIV-infected patients (Lucas, 2002). Recently introduced antiretroviral (ARV) drugs, which reduce mother to child transmission (MTCT), prolong life and reduce morbidity in HIV positive children are likely to provide a new platform for the management of paediatric HIV. However, in order for these interventions to achieve the desired goals, the magnitude of the problem has to be established so that appropriate investments are made in terms of personnel, drugs, diagnostic tools and other resources. This study therefore, was conducted to determine the magnitude of HIV infection and the pattern of the prevailing opportunistic infections in children in a district hospital in rural Kenya.

Materials and Methods

Study area

This study was conducted at Kilifi District Hospital (KDH) paediatric ward. Kilifi Hospital is situated 60km north of Mombasa along the Indian Ocean coast in Kenya. The district hospital serves a population of over 230,000 and the paediatric unit admits more than 5000 children per year (KDH, unpubl.). Majority of the residents are subsistence farmers with only 4% estimated to have waged employment. The area is hyperendemic for malaria with two peaks of transmission during the year, April-June and November-December (Hay *et al.*, 1998). Malnutrition is also endemic in the area with 41% of those admitted being undernourished (weight for age percentile 60-80%) and 16% of

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severely malnourished (weight for age <60%) children (KDH, unpubl.).

Study candidates and laboratory investigations

The study involved all children who were admitted to KDH over an 18 month-period from January 2004 to June 2005. Children clinically suspected or those with signs and symptoms suggestive of HIV/AIDS were offered an opportunity for HIV test. Before testing, the parents/guardians of all eligible children received counselling for HIV testing by trained counsellors. HIV testing was done using Determine (Abbot Lab, Tokyo, Japan) and Unigold (Trinity Biotech, Ireland) tests. Both tests had to be positive for a child to be considered HIV positive. When only one test was positive, a tiebreaker test was performed with the Unigold method. The children were then discharged through the outpatient Family Health Clinic (FHC) for follow up. Children <18 months of age who tested positive were followed up at the FHC until they reached 18 months when the HIV test was repeated. If the test was positive they were enrolled at the FHC for further follow-up. Those found negative were discharged from the clinic. All children found to be HIV-positive were offered prophylactic co-trimoxazole. Blood for culture was taken from children suspected to have septicaemia or bacteraemia.

Data analysis

Data was analysed using EPI info 2002 software. Proportions were calculated and tables prepared.

Results

A total of 7519 children were admitted at KDH during the study period. The main reasons for admission were malaria (52.5%), lower respiratory tract infections (LRTI) (16.5%), gastroenteritis (12.8%), malnutrition (7.3%) and neonatal sepsis (6%). Other conditions included abscess (1.4%), meningitis (1.3%) septicaemia (1.0%), pulmonary tuberculosis (0.6%), otitis media (0.3%) and encephalopathy (0.1%).

A total of 681 (9.1%) requests for HIV test were made, however, only 426 children were tested. The remaining 255 children were not tested because some of the parents/guardians refused consent. Some children were discharged home or died before testing. Of those who were tested 31.9% (136) tested positive.

A total of 163 children with clinical features of AIDS were admitted at the hospital during the 18-month period. Sixty (36.8%) children were below <18 months and 103 (64.2%) were ≥ 18 months old. There were 84 (51.5%) boys and 79 (49.5% girls). The median age was 2 years and ranged from 8 days to 11 years. The median duration of hospital stay for children with AIDS was 11 days (range 2 days to 6 weeks). The frequency of HIV positivity was 2.2%.

In the two age groups, AIDS associated conditions included malnutrition (44.8%), pulmonary tuberculosis (20.9%); lower respiratory tract infection (LRTI) (15.3%), gastroenteritis (4.9%), meningitis (3.1%) and septicaemia (2.4%). Others included abscess, encephalopathy, neonatal sepsis and otitis media. The proportion of the conditions in relation to the two age groups is summarised in Figure 1.

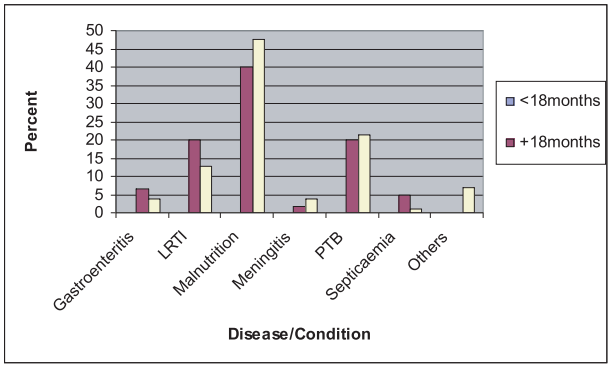

Figure 1: HIV/AIDS associated conditions (%) in children admitted at Kilifi Hospital

Table 1: Causes of mortality in children with HIV/AIDS at Kilifi Hospital

Cause	< 18 Months Frequency	%	≥18 Moths Frequency	%	Total
Gastroenteritis	2	13.3	1	5.3	3
Lower respiratory tract infection	6	40.0	4	21.1	10
Malnutrition	5	33.3	8	42.1	13
Meningitis	0	0	2	10.5	2
Neonatal sepsis	1	6.7	0	0	1
Pulmonary tuberculosis	0	0	3	15.8	3
Septicaemia	1	6.7	1	5.8	2
Total	15	10	19	100	34

Key: LRTI = lower respiratory tract infection

Majority (75.4%) of the children with pulmonary tuberculosis (PTB) tested positive for HIV. Of the total 163 children with HIV, 3 (1.8%) absconded and 34 (20.9%) died in hospital. The fate of those who absconded could not be established. Malnutrition and LRTI were the main cause of deaths in both age groups (Table 1).

Bacteraemia occurred in 58 (35.6%) of the HIV positive children and it was more frequently observed among children with malnutrition. Bacillus species and *Staphylococcus epidermidis* were most common isolates from blood cultures (Table 2).

will be HIV positive by the time they reach 18 months. Protecting these babies from contracting HIV infection from their mothers by exclusive breast feeding or replacement feeding is difficult in many communities due to poverty as most people can not afford to buy artificial milk. In this area, babies are usually fed some other types of food like meal porridge when the mothers sometimes go for farming or other activities away from their homes.

This study revealed that malnutrition and pulmonary tuberculosis ere the major conditions associated with HIV/AIDS among children in Kilifi, Kenya. The findings that HIV/AIDS occurs

Table 2: Blood cultures isolates identified at Kilifi District Hospital

Bacteria	<18 months		≥18 months	
	Frequency	%	Frequency	%
Acinetobacter spp	1	4.2	2	5.9
Bacillus spp	6	25.0	8	23.5
β-haemolytic Streptococcus	1	4.2	2	5.9
Campylobacter jejuni	1	4.2	0	0
Escherichia coli	3	12.5	1	2.9
Haemophilus influenzae	1	4.2	3	8.8
Pseudomonas spp	0	0	1	2.9
Salmonella spp	1	4.2	2	5.9
Staphylococcus epidermidis	9	37.5	9	26.5
Streptococcus pneumoniae	1	4.2	6	17.7
Total	24	100	34	100

Discussion

The frequency of HIV infection among children admitted at Kilifi District Hospital in our study was relatively higher than findings from other studies done in the area in 2002 (Berkley, 2002). This increased frequency of HIV infection is likely to be due to increase in screening rates among children admitted at the hospital as well as due to actual increase in number of children with HIV as a reflection of the increase in infection rate in adults.

Majority of the children who tested positive for HIV were above 18 months of age. The techniques used for HIV testing were the Rapid Immunoglobulin tests which can not confirm HIV status in children aged less than 18 months due to persisting maternal antibodies. This is because even those children who had escaped contracting HIV in utero or during delivery little chance exist for them to escape it postnatal due to lack of interventions to prevent MTCT as a result some of these children

commonly in malnourished children have been reported elsewhere in Africa (Kawo *et al.*, 1995). Malnutrition was the main cause of death among the admitted children. Similar findings have been previously reported among paediatric admissions in East Africa (Kawo *et al.*, 2000; Berkley, 2002; Bachou *et al.*, 2006). In a study in Dar es Salaam, Tanzania, Kowe *et al.* (2000) reported that the three most common diagnoses in HIV-1 infected children included acute respiratory infection, malnutrition and tuberculosis. In Eldoret, Kenya, Esamai & Buku (1994) found a high prevalence of HIV positivity rate in diarrhoeic children who presented with pneumonia and malnutrition. In Uganda, one third of the severely malnourished children admitted at Mulago hospital were HIV positive in a study by Bachou *et al.* (2006).

Malnutrition is a common finding in children with HIV/AIDS because of the vicious cycle existing between malnutrition and HIV. Poor food intake, malabsorption syndromes, increased

utilization of energy and socio-economic stresses posed by HIV/AIDS to the affected families contribute to their malnutrition. In addition, other conditions like oral lesions, gastric irritation, nausea, vomiting and diarrhoea contribute to poor nutrition. These children also live in communities where malnutrition is endemic due to food insecurity therefore HIV/AIDS may only be exacerbating the already pre-existing malnutrition (Berkley, 2002).

Although pulmonary tuberculosis and gastroenteritis were observed with low frequency in our study, they are known to be important diseases among HIV-infected persons. Worldwide, pulmonary tuberculosis is the leading killer of people with HIV, and the course of both HIV and tuberculosis is more rapid and deadly in persons with both infections. In Africa, half of all tuberculosis cases are associated with HIV (WHO, 2002). Esamai & Buku (1994) found that 50.9% of children admitted at Eldoret District Hospital, Kenya with diagnosis of diarrhoea were HIV positive.

The immune suppression in HIV positive children predisposes them to pulmonary tuberculosis and other respiratory infections. Since children born of HIV infected mothers who are also immunosuppresed and most likely suffering from pulmonary tuberculosis, are likely to transmit it to their children. Over one million children worldwide are living with HIV infection and respiratory disease is the commonest cause of morbidity and mortality in these children (Graham & Gibb, 2002). A study conducted among paediatric cohort in Ethiopia revealed that 18% of the HIV infected infants develop TB compared to 1.4% of the non-HIV infected infants (Fontanet *et al.*, 1998). The resurgence of some diseases like tuberculosis, *Pneumocystis carinii* pneumonia and malnutrition has been directly related to HIV/AIDS (Tindyebwa *et al.*, 2004). It is estimated that at least 90% of HIV-infected children experience wasting and nutritional deficiencies during the course of their illness (Musoke *et al.*, 2005).

Positive bacterial cultures were common in HIV positive children (35.6%). It is likely that the immunosuppression due to HIV and malnutrition predisposes children bacterial infections. Bacillus species were the commonest bacteria isolates from blood culture. However, the high frequency of *Staphylococcus epidermidis* isolate indicated a significant high level of contamination. Like in our study, *Escherichia coli* and group B streptococci have been observed to be the predominant bacterial isolates among infants admitted to a rural district hospital in Kenya (Berkley *et al.*, 2005).

Mortality was significantly high in children with HIV/AIDS compared to other non-HIV positive children admitted at the hospital. A similar high mortality among HIV-positive children found in this study has been reported in other parts of Africa (Kaiser, 2004). This high mortality is likely to have been attributed to late treatment seeking behaviour among the people in this part of Kenya. However, this study was carried out before the introduction of antiretroviral treatment programme; hence children were likely to succumb to AIDS earlier in their lives.

This study indicates that the prevalence of HIV infection in children is significantly high in this area and it is associated with high morbidity and mortality. Appropriate interventions are therefore, needed to contain the pandemic. Because vertical transmission from mother to child is the main route by which paediatric HIV infection is acquired, children who are HIV positive should be identified in infancy to allow early provision of antiretroviral treatment. It is also important that new infection in children are reduced. This can be achieved by ameliorating the adult HIV infection, use of safe blood supply for transfusion, and prevention of mother to child transmission.

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